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CYRTANDREAE HAWAIIENSES, SECT. CROTONOCALYCES HILLEBR.

JOSEPH F. ROCK

SECTION TWO: CROTONOCALYCES HILLEBR. FL. HAW. ISL. 325. 1888

Calyx cleft to the middle or less into broad lobes or teeth. Leaves broad, generally rounded or cordate, truncate, peltate or unevensided at the base. Young shoots, leaves, and inflorescence villous with golden or dark brown multicellular hairs.

This section comprised originally eight species and two varieties, *C. cordifolia*, *C. Pickeringii*, *C. honolulensis*, *C. begoniaefolia*, *C. malacophylla*, *C. platyphylla*, *C. Wawrai*, and *C. Kealiae*. Hillebrand's var. *crassifolia* of *C. Pickeringii* which has been raised to specific rank by the writer (*C. crassifolia* (Hillebr.) Rock), and Hillebrand's var.  $\beta$  of *C. platyphylla* (now *C. platyphylla* var. *hiloensis* Rock) were the two recognized varieties. A possible ninth species is C. B. Clark's *Cyrtandra baccifera*. This species is, however, of doubtful validity. It belongs in all probability to some form of *C. platyphylla* A. Gray.

To the species and varieties above enumerated there have been added the following: new species, *Cyrtandra mauiensis*, *C. tintinnabula*, *C. Knudsenii*, and *C. caulescens*; new varieties, *Cyrtandra cordifolia* Gaud. var. *gynoglabra* Rock, *C. mauiensis* Rock var. *truncata* Rock, *C. malacophylla* C. B. Clarke var. *erosa* Rock, *C. platyphylla* A. Gray var. *robusta* Rock, var. *membranacea* Rock, var. *stylopubens* Rock, var. *parviflora* Rock; and one new form, *Cyrtandra platyphylla* *stylopubens* forma *ovata*. One species, Wawra's *Cyrtandra honolulensis*, has been reduced to a variety as *C. Pickeringii* var. *honolulensis*. It differs from the species only in the pubescent ovary and membranous leaves. One variety, *C. Pickeringii* var. *crassifolia* Hillebr., has been raised to specific rank as *C. crassifolia* (Hillebr.) Rock. Hillebrand's var.  $\beta$  of *Cyrtandra platyphylla* has been given a varietal name, *hiloensis*. *Cyrtandra paritiifolia* Hillebr. was found to be identical with *C. malacophylla* C. B. Clarke, and the latter, an earlier name, was adopted. This brings the Hawaiian species in this section to twelve (possibly thirteen) species, eight varieties, and one form.

For the Hawaiian species the writer has adhered to the sections of Hillebrand rather than those of C. B. Clarke, who places together heterogeneous species and separates related ones. Clarke's section name *Macrosepala* might be adopted for *C. cordifolia* and *C. Wawra* and perhaps for *C. tintinnabula* but not for the other species. Much more satisfactory is Hillebrand's grouping based upon depth of division of the calyx.

CYRTANDRA KEALIAE Wawra, Flora 30: 565. 1872

A shrub about 2 m. high; leaves opposite, the upper ones rarely ternate, elliptical-ovate, cuneate at the base or decurrent, acuminate at both ends, on both sides somewhat covered with ferruginous hairs, especially along the midrib and veins underneath, the margin denticulate, 7–16 cm. long, 4–7 cm. wide, the petioles 2–6 cm. long; flowers solitary in the axils on peduncles 5 mm. long, the pedicels 2 mm. long, the latter bi-bracteate at the base; bracts ovoid-oblong, about 7 mm. long, 3 mm. wide, hirsute with yellowish hairs as are the peduncle and pedicel; calyx urceolate, 14–18 mm. long, 6–7.5 mm. wide, including the 5 mm. long calycine lobes, densely hirsute outside with yellowish-brown hairs 1.5 mm. long, densely villous inside, the silky wool more than 2 mm. in length; corolla twice as long as the calyx, hirsute outside, villous inside; ovary ovoid, glabrous as is the style; fruit 8 mm. long, ellipsoidal.

KAUAI: About Kealia, Wawra no. 2192 in herb. Vienna; Waimea leg. Knudsen no. 203 herb. Hillebr. in herb. Berlin, and in herb. College of Hawaii, no. 13051 ex coll. Hillebr.; Olokele Valley, Abbé A. Faurie, without flower or fruit, March, 1910, nos. 629 and 13052 in herb. College of Hawaii; Olokele Canyon, flowering Oct., 1916, Rock no. 13053 in herb. College of Hawaii; same locality, A. S. Hitchcock, Oct. 18, 1916, nos. 15204 and 15205 in U. S. Nat. Herb.

This species is readily recognized by the densely villous calyx and the short-peduncled single flowers. Wawra's statement is quite correct, that it is difficult to differentiate the reproductive organs owing to the silky, glossy, yellowish-brown hair with which the persistent calyx is completely filled. In the writer's specimens the flowers are not fully developed; the ovary is glabrous but the style is pubescent at the apex only. Wawra states only that the ovary is ovoid, while C. B. Clarke states that the ovary is glabrous with the style. It is doubtful if Faurie's no. 629 belongs here, as the specimen in the College

of Hawaii Herbarium is without flower or fruit. The leaves, however, agree quite well with the typical *C. kealiae*.

**Cyrtandra Knudsenii** Rock n. sp.

A shrub 2–3 m. high; branches quadrangular towards their apices, stout and hirsute with yellowish hairs; leaves ovate to obovate-oblong, coriaceous, dark green above, dark brown beneath, covered on both sides with dark brown silky appressed hairs, the leaf margin obscurely denticulate and bordered with dense deep golden-brown hairs, acute at both ends, somewhat unsymmetrical at the base, 8–12 cm. long, 3–6 cm. wide, the petioles 2–4 cm. long; peduncles 7–15 mm. long; bracts linear-lanceolate, 6–10 mm. long; pedicels one to three 10–18 mm. long, densely villous-hirsute as are the peduncle, bracts and calyx, the latter unevenly split often to near the base into oblong, acute lobes, 6–20 mm. long, 4 mm. wide, triplinerved, hirsute inside; corolla somewhat protruding, curved, densely hirsute, the lobes oblong; ovary glabrous, ovoid; style nearly 1 cm. long, thickened towards the apex, more or less hirsute.

KAUAI: Halemanu forests, elevation 3,600–4,000 feet, drier forest lands of Kōpiwai in company with *Alphitonia excelsa*, *Platydesma cornutum*, *Antidesma platyphyllum*, *Cyanea leptostegia*, *Cyanea hirtella*, etc., flowering Feb. 16, 1909, Rock no. 1688, type in herb. College of Hawaii; Kaholuamano, drier forest, flowering Sept., 1909, Rock no. 5603 in herb. College of Hawaii; same locality, flowering and fruiting Oct. 20, 1916, A. S. Hitchcock no. 15360 in U. S. Nat. Herb.

The specimens from Kaholuamano differ somewhat from those of Halemanu in the shorter and consequently less deeply lobed calyx. The Halemanu specimens have the calyx divided almost to the very base; the lobes are somewhat constricted below the middle but not stipitate as in *C. kauaiensis*, neither are they thin and green, but thick and densely hirsute with brownish hairs, the fruit in *Cyrtandra kauiensis* is hirsute at the apex which would indicate a pubescent or hirsute ovary. The bracts in *C. kauaiensis* are minute and filiform, while in *C. Knudsenii* they are linear-lanceolate. The species is related to *C. kauaiensis* Wawra but must be classed with *C. platyphylla* and *C. Pickeringii*.

In the collection made by A. S. Hitchcock on Kauai the writer found a species of *Cyrtandra*, collected in the type locality, Kaholuamano, which must be referred to *C. Knudsenii* Rock. In Hitchcock's

specimen no. 15360 the fruit is densely hairy, and the rather large calycine lobes are reflexed.

CYRTANDRA MALACOPHYLLA C. B. Clarke in DC. Monogr. Phan. 5: 227. 1883

*Cyrtandra paritiifolia* Hillebr. Fl. Haw. Isl. 328. 1888.

Branches terete, softly villous; leaves ovate-cordate, minutely denticulate, shortly acute at the apex, 7 cm. long, 5-6 cm. wide, sparsely covered above with multicellular hairs, yellowish tomentose to densely villous beneath, the villous petioles 4 cm. long, peduncle 2 cm. long, few-flowered; bracts 1 cm. long, elliptical, subacute; pedicels 1 cm. long, calyx 12 mm. long, softly villous, deeply 5-fid to near the base, the lobes lanceolate; corolla glabrous outside; ovary and style glabrous; fruit ovoid, elongate, 14-16 mm. long.

KAUAI: Hillebr., herb. Kew, teste C. B. Clarke.

MAUI: West Maui, gulch of Oloalu, flowering Aug., 1870, Hillebr. in herb. Berlin, part of his type (*C. paritiifolia*) in herb. College of Hawaii; East Maui, Hamakua, Haleakala, fruiting, Lydgate, herb. Hillebr. in herb. Berlin.

There is no doubt that *C. malacophylla* is identical with *C. paritiifolia*. The only question arises as to the locality mentioned; the specimen cited by C. B. Clarke as the type of *C. malacophylla* is supposed to be from Kauai (ex coll. Hillebr. in herb. Kew). The description answers perfectly to the specimen (ex herb. Hillebr.) in the College of Hawaii Herbarium, which is part of Hillebrand's type of *C. paritiifolia*. Drake del Castillo also unites these two plants (Ill. Fl. Ins. Mar. Pac.).

*C. malacophylla* is mainly distinguished by the small leaves, deeply and broadly lobed calyx and glabrous corolla.

Hillebrand's specimen in the Berlin Herbarium was originally labeled *Cyrtandra cordifolia* var. *subglabra*.

CYRTANDRA MALACOPHYLLA *erosa* Rock n. var.

A small brittle shrub 1.5 m. high; leaves as in the species, the margin erose-dentate, green and densely tomentose above, yellow and villous beneath especially on midrib and veins; peduncle much longer than in the species, 5 cm. long; bracts ovate, acute, dentate in the upper part; pedicels 1.5-2 cm.; calyx oblong-campanulate, the lobes broad and short, 3-4 mm. long; corolla long-exserted, curved, hirsute in the upper part; ovary glabrous.

MAUI: On the edge of Honokawai gulch, elevation 4,500 feet, boggy forests, West Maui, flowering Aug., 1910, Rock and Hammond no. 8171, type in herb. College of Hawaii.

This variety differs from the species mainly in the hirsute corolla, short-lobed calyx, longer peduncles, and erose-dentate leaves. This variety and *C. cordifolia gynoglabra* seem to be intermediate between *C. cordifolia* and *C. malacophylla*.

CYRTANDRA WAWRAI C. B. Clarke in DC. Monogr. Phan. 5: 228.  
1883

*Cyrtandra peltata* Wawra in Flora 30: 565. 1872. Not Jack, 1825.

*Cyrtandra Wawrae* Hillebr. Fl. Haw. Isl. 328. 1888.

A branching shrub 3 m. high or less, the young shoots and inflorescence hirsute with pale ochraceous hairs, the stems quadrangular, glabrate; leaves opposite, broad-ovate, acuminate at the apex, dentate, asymmetrical at the base, 20–28 cm. long, 12–16 cm. wide, densely hirtellose above, tomentulose beneath, peltately affixed 2.5–5 cm. above the base, the petioles 7.5–14 cm. long; peduncles 12–25 mm. long, hirsute, stout, bearing from three to fourteen pedicels 30–40 mm. long; bracts large, foliaceous, ovate, about 25 mm. long; calyx urceolate-campanulate, tomentose inside and outside, 25 mm. long, the lobes broad, ovate-lanceolate, half the length of the tube; corolla slightly exerted, the lobes small; ovary and style glabrous; berry included in the calyx, globose, glabrous.

KAUAI: Wasserfall, on Hanalei, Wawra, type no. 2002 in herb. Vienna, part of type in herb. College of Hawaii, also Hanalei (leaf only), Wawra, March, 1870; Waimea, Knudsen, two sheets (flowering specimens) in herb. Berlin; Hanalei waterfall, June 24, 1895, Heller no. 2437; Olokele Valley at the head of intake on rock-walls flowering and fruiting, Sept., 1909, Rock no. 5397 in herb. College of Hawaii; Kaholuamano, elev. 3,800 feet along stream bed, fruiting Oct., 1911, Rock no. 13070, in herb. College of Hawaii; Hanapepe Valley, fruiting Dec., 1909, Abbé Faurie no. 601, specimen in herb. College of Hawaii; Olokele Valley, elev. 1400 feet, Oct. 18, 1916, A. S. Hitchcock no. 15207 in U. S. Nat. Herb.

*Cyrtandra Wawrae* is certainly a well-marked species and is peculiar to Kauai. Heller states: "Described by both Wawra and Hillebrand as a branching shrub. In no case have I seen it branching." When growing at lower elevation on rock wall as for example in Hanalei and Olokele canyons it is unbranched. But the plants from Kaholuamano are several feet in height and are branching shrubs. The specimens from this latter locality are stouter and larger in every way.

CYRTANDRA CORDIFOLIA Gaud. Bot. Voy. Uranie 446, t. 56. 1826

A shrub 1.5–2.5 m. high, freely branching from the base, the young shoots villous with pale ochraceous hairs; leaves opposite, ovate-suborbicular, shortly acuminate at the apex, cordate at the base, sharply dentate or serrate, 15–20 cm. in diameter, membranaceous to chartaceous, the petioles 5–15 cm. long; peduncle 2.5–6.5 cm. long, subumbellately several-flowered; flowers four to ten on pedicels 15–20 mm. long; bracts foliaceous, broadly lanceolate, 1.5–4 cm. long; calyx membranaceous, whitish, villous inside and outside, cup-shaped, 15 mm. high, evenly divided to the middle or beyond into broadly ovate or triangular lobes, rotately expanded when in fruit or even reflexed; corolla villous, broad tubular, straight, about 15 mm. long, the short lobes rounded, nearly equal; ovary and style villous, the latter very short, articulate below the stigma; berry broad-ovoid, pubescent.

In insulis Sandwicensibus, Gaudichaud, altitude 100–300 hex. leg. 1829. Also visit of 1841.

OAHU: In herb. Berlin, ex coll. Gaudichaud, two sheets, visit 1829 and 1841, ex coll. Meyen, leaves only, ex herb. Soc. Hort. London, Ins. Owhyhee, ad montem-Kaah, Macrae, Junio, 1825,<sup>1</sup> Lindley, visit 1832, Woahoo, Bennet Collection, ex coll. Hillebrand, two sheets, Aug., 1870; in herb. Vienna, Wawra, 3 sheets, det. C. B. Clarke, no. 1743; in herb. College of Hawaii, ex coll. Hillebrand, ex Mus. Bot. Berlin, one sheet, flowering specimen, Aug., 1870, Tantalus, flowering Dec. 2, 1906, Otto H. Swezey, no. 12774, Koolau Mts., Wahiawa range, flowering, Aug., 1908, Rock no. 28, Pauoa Valley, flowering, Oct. 24, 1908, Rock no. 702, Palolo Valley, flowerbuds 1915, Rock no. 1198, Nuuanu Pali, fruiting Oct., 1909, Abbé Faurie no. 602; in U. S. Nat. Herb., Schofield Barracks, East Range, flowering July 11, 1916, A. S. Hitchcock, no. 14037.

One sheet in the Hillebrand collection came from the southern slopes of Mt. Haleakala, 1870. This plant is referable to *Cyrtandra cordifolia gynoglabra* Rock. *Cyrtandra cordifolia* is a very distinct species and can never be mistaken. It is confined to the island of Oahu, although related species occur on Maui. The variety *gynoglabra* differs mainly in the glabrous ovary. In *C. cordifolia* the ovary is densely villous.

<sup>1</sup> This plant seems to have been collected on Hawaii and represents *Cyrtandra platyphylla*; the leaves are rounded but not cordate.

CYRTANDRA CORDIFOLIA **gynoglabra** Rock n. var.

Habit of species; leaves ovate to orbicular in outline, acute at the apex, somewhat oblique and cordate at the base, dark green above, hirsute, dirty brown beneath; peduncles shorter, 3.5 cm. long; calyx as in the species, the lobes very broad-triangular; corolla hirsute; ovary glabrous, as is the articulate style.

MAUI: Eastern part, southern slopes of Mount Haleakala in gulch near Kaupo, 5,000 feet, flowering Nov., 1910, Rock no. 8687 in herb. College of Hawaii.

This plant differs from the species occurring on the island of Oahu at a much lower elevation (1,000–1,500 feet) mainly in the glabrous ovary; the calyx lobes are, as in the species, deltoid to broadly triangular-ovate, and the plant agrees in all other respects with *C. cordifolia*. It differs from *C. begoniaefolia* in the cordate leaves and broad calyx lobes, while the lobes of *C. begoniaefolia* are erect, lanceolate, acute. Hillebrand does not state whether the ovary is glabrous or not.

*Cyrtandra begoniaefolia* occurs, or rather is supposed to occur, at Ulupalakua not far from where *C. cordifolia gynoglabra* grows, but the writer has been unable to relocate it.

CYRTANDRA **crassifolia** (Hillebr.) Rock (See Pl. XVIII)

*Cyrtandra Pickeringii*  $\beta$  var. *crassifolia* Hillebr. Fl. Haw. Isl. 327. 1888.

A small stout bush 1 m. high, the stem and branches quadrangular, stout, with corky scaly bark, villous only at the apex, glabrous below; leaves ovate to suborbicular, cordate to obliquely cordate, acute to subacuminate at the apex, densely villous on both sides with fulvous hairs, thick-fleshy, with prominent midrib and nerves, the margin irregularly dentate to serrate, 6–8 cm. long, 4.5–8 cm. broad, the hirsute petioles 3–7 cm. long; inflorescence hirsute throughout; peduncle short, 1 cm. long, the bracts linear-lanceolate, acute, 6–8 mm. long; pedicels 12–20 mm. long; calyx as in *C. Pickeringii*, glabrous inside; corolla exceeding the calyx, about 2 cm. long, curved and hirsute, the lobes rounded, of unequal size; ovary ovoid, glabrous as is the style; stigmatic lobes oblong-spathulate, 2 mm. long; fruit ovoid, acute, glabrous.

OAHU: High ridge of Niu Valley, Hillebrand, no specimen extant; summit ridges above Punaluu Mts., windward side, in exposed situation in company with *Lobelia Gaudichaudii*, *Trematolobelia macros-tachys*, etc., flowering and fruiting Dec. 24–29, 1908, Rock no. 492; same locality, flowering Aug., 1911, Rock no. 8825 in herb. College of Hawaii.



No specimen of Hillebrand's *C. Pickeringii*  $\beta$  var. *crassifolia* is in Hillebrand's herbarium, nor in any other herbarium so far as the writer is aware. His type was evidently distributed or was lost. The description however answers the writer's material from the summit ridges of Punaluu, as far as the inflorescence is concerned; the leaves have no resemblance to leaves of *C. Pickeringii*, and Hillebrand gives no description of them under his var. *crassifolia*. The plant is totally distinct from *C. Pickeringii* even in habit. It is of much smaller stature and the thick fleshy leaves occupy a vertical position on the horizontally arranged petioles, giving the plant a peculiar aspect.

**Cyrtandra mauiensis** Rock n. sp. (See Pl. XIX)

A tall shrub 3 m. or more high, the branches quadrangular, with large leaf scars, densely hirsute with brownish hairs towards the apex; leaves large, obliquely cordate at the base, subcaudately acuminate at the apex, thick-coriaceous, pubescent above, tomentose underneath, but villous along the midrib and veins, the margin denticulate-serrate, 15–22 cm. long, 10–14 cm. wide, on hirsute petioles 5–11 cm. long; inflorescence in the axils of the lower leaves; peduncle 3.5–6 cm. long, hirsute; bracts ovate-oblong, acute, hirsute, caducous, 24 mm. long, 12 mm. wide; pedicels several to ten, up to 2.5 cm. long, with additional linear-oblanceolate bracts at the base of some of the pedicels; calyx oblong, nearly 2 cm. long, divided more than one-third its length, or irregularly, into ovate acute lobes, hirsute inside and outside; corolla exerted one half its length, hirtellous outside, ampliate above the middle and straight; ovary elongate, elliptical-oblong, glabrous; style apparently continuous with the ovary, glabrous; fruit glabrous, elliptical, enclosed in the calyx.

MAUI: Honomanu gulch, along lower ditch trail (Kailua), dense wet forest, northern slopes of Mt. Haleakala, elev. 2,400 feet, flowering May, 1911, Rock no. 13028, type in herb. College of Hawaii.

This species is related to *C. malacophylla* C. B. Clarke, but differs from it in the large, ovate-oblong, subcaudately acuminate leaves, large inflorescence, oblong calyx, straight, ampliate, and hirsute corolla.

**CYRTANDRA MAUIENSIS truncata** Rock n. var.

Leaves smaller, ovate-acuminate, but contracted at the base and cuneate-truncate to rounded or subcordate, the petioles as long as in the species but densely strigosely hispid with golden-brown hairs; inflorescence many-flowered; bracts smaller; calyx larger, the two lower lobes oblong-acute, the three upper very short, 3–4 mm. long, the whole calyx irregularly split, villous on both sides; fruit glabrous, ovoid-oblong, the young fruits crowned by the long recurved articulate style, later becoming caducous.

MAUI: East Maui, northern slopes of Mt. Haleakala, along the Kula pipe line trail near Honomanu gorge in dense wet forest, elev. 4,000 feet or more, fruiting Sept., 1910, Rock no. 8548, type in herb. College of Hawaii.

A. S. Hitchcock collected a specimen on Maui, east of Olinda, elevation 4,000 feet, fruiting Oct. 1, 1916, no. 14911, in U. S. Nat. Herb. It differs from the writer's specimens in the much larger leaves (23 cm. long, 15.5 cm. wide), which are emarginate at the base or very shallow-cordate, the petioles 17 cm. long. The inflorescence is the same, but the tomentum or rather pubescence of the whole plant is darker and of a less glossy brown.

Another specimen collected by A. S. Hitchcock on West Maui, Mt. Puukukui, on Sept. 24, 1916, no. 15593 in U. S. Nat. Herb., belongs here. It differs somewhat from the East Maui specimen in the smaller leaves and more evenly lobed calyx, the flowers much exerted. It is close to *C. malacophylla* C. B. Clarke, but the latter has small leaves and a small inflorescence and shorter flowers.

This variety occurs nearly two thousand feet higher than the species. It is easily distinguished by the leaves which are ovate and not ovate-oblong; the base is mainly cuneate to truncate instead of deeply and unevenly cordate. It is in all probability related to *Cyrtandra malacophylla* C. B. Clarke, but differs from it in the larger leaves and large inflorescence, the long peduncle and larger calyx with irregular lobes.

The locality where the species and variety occur were inaccessible until some seven years ago, when these dense forests and gorges were explored for the first time by the writer. A trail had been blazed at that time for surveying purposes.

***Cyrtandra tintinnabula* Rock n. sp. (See Pl. XX)**

A shrub 2 m. or more high, soft-wooded, resembling *C. cordifolia*; leaves opposite, broadly ovate to suborbicular, irregularly dentate and ciliate at the margin, acute or cuspidate at the apex, decurrent to truncate and more or less asymmetrical at the base, never cordate, the first lower pair of veins almost at right angles to the petiole, dark green above, pale beneath, pilose above with five- to seven-celled, articulate transparent hairs, the cells short and broad, pubescent below especially along the midrib and veins with equally transparent 3-5-celled hairs, the joints narrower and much longer, the blades 10-14 cm. long, 7-12 cm. wide, the petioles 3-10 cm. long; inflorescence cymose, fulvous hairy throughout, the peduncle 10-12 mm. long, with two

large broad clasping bracts of irregular shape; flowers usually six: pedicels of unequal length, varying from 5–11 mm.; calyx broad, campanulate, the bell-shaped tube 6 mm. long, the lobes broadly triangular, 3–4 mm. each way, reflexed from the truncate margin of the tube, hirsute inside especially near the margin and lobes, subglabrous towards the base; corolla straight, cylindrical, 12 mm. long, 5 mm. wide, the tube exerted 8 mm., the lobes short, rounded, subequal, glabrous inside, yellowish-hirsute outside, only the lower portion of tube subglabrous to glabrous; ovary surrounded at the base by a glabrous annular disc; ovary glabrous, only part of style and apex of ovary slightly pubescent with scattered multicellular hairs; fruit unknown.

HAWAII: In the forests of Paauhau no. 2, near waterfalls between the crevices of huge boulders, northern slope of Mauna Kea, elevation 3,000 feet, flowering July 3, 1909, Rock no. 3290, type in herb. College of Hawaii.

This interesting species belongs to the group with *C. cordifolia* rather than *C. platyphylla* on account of the triangular, reflexed calycine lobes. It differs from the latter in the subglabrous ovary, smaller calyx and straight cylindrical corolla, the short peduncle and oblique (not cordate) leaves. The name *tintinnabula* refers to the bell-shaped calyx.

CYRTANDRA BEGONIAEFOLIA Hillebr. Fl. Haw. Isl. 328. 1888

Size and habit of *C. cordifolia*; young branches and inflorescence villous with a bright shining pale-fulvous tomentum; leaves opposite, broadly ovate, 17.5–20 cm. long, 8.75–10 cm. wide, inequilateral, oblique, cuspidate, sharply dentate with broad patent teeth, rounded at the base, with one side much more deeply attached than the other to a petiole about 7.5 cm. long, thick chartaceous, hirsute above, tomentose beneath, with ribs and veins villous; peduncle fleshy, 24 mm. long, bearing three or more flowers on pedicels 20 mm. long; bracts foliaceous, ovate-lanceolate, 24 mm. long; calyx villous, thin funnel-shaped, 20 mm. long, divided to the middle or less into erect lanceolate acute lobes; corolla as long as the calyx, villous or pubescent, straight.

MAUI: East Maui, southern slopes of Mt. Haleakala, Ulupalakua, flowering Sept., 1870, Hillebrand in herb. Berlin, part of type in herb. College of Hawaii.

There is only one sheet of this species in the Berlin Herbarium (ex coll. Hillebr.). It was originally labeled by Hillebrand "*Cyrtandra triflora* Gaud. var. *β arguta folia unequilateralibus*." The place known as Ulupalakua on East Maui must have been more or less covered with forest in Dr. Hillebrand's days. Today there is nothing but

meadow land and planted Eucalypti. Many plants which were peculiar to that region, as for example *Cyanea comata*, *Cyanea arborea* and others, have vanished forever and among them is also *Cyrtandra begoniaefolia*. This species could only have thrived in dense shady forests,<sup>2</sup> which today are no more and their place is taken by a cattle ranch, covered with obnoxious weeds. The writer is acquainted with *C. begoniaefolia* only from the single sheet in the Hillebrand collection. It differs mainly from *C. Pickeringii* to which it is related, in the oblique, not cordate leaves.

CYRTANDRA PLATYPHYLLA A. Gray, Proc. Amer. Acad. 5: 350. 1862

Plant about 3.5 m. high; leaves subrotund to cordate at the base, shortly acuminate, denticulate, 12–20 cm. long, slightly less wide, shortly and densely yellowish-pilose above, pubescent to subvillose beneath, the petioles 3–6 cm. long; peduncles 3 cm. long, many flowered, the bracts never clasping; pedicels 1 cm. long; calyx at flowering about 1 cm. long, irregularly 5-fid, the lobes oblong-lanceolate or broadly lanceolate, shorter than the corolla; ovary and style glabrous; fruit narrow-oblong, sessile.

HAWAII: In forests, U. S. Exploring Exped.; Hilo forests, Hillebrand, one sheet ex coll. Hillebrand in herb. Berlin; forests near the Volcano of Kilauea, elev. 3,800 feet, Kalanilehua, flowering Aug., 1917, Rock no. 12990 (*typica*); Naalehu forest, Kau, elev. 3,500 feet, flowering Jan., 1912, Rock no. 10030 in herb. College of Hawaii; Kohala Mts., Alakahi—Kawainui ditch trail, flowering July 13, 1909, Rock no. 4474 in herb. College of Hawaii.

*Cyrtandra platyphylla* with its varieties and forms is certainly the predominating species on the island of Hawaii. In fact it is the most variable species of Cyrtandreae in the Hawaiian Islands. This tends to show that it is still in the process of evolution, as is the case with certain species of Lobelioideae on the same island. It may be stated that Hawaii has fewer species of *Cyrtandra* than any other island of this archipelago. There are a few arborescent forms and one or two herbaceous ones as *C. paludosa*, but nothing like the number of species, really distinct species, that occur on Oahu or Molokai.

Kauai possesses about the most settled species, but they are few in number compared to those occurring on Oahu and Molokai. What is lacking in species on Hawaii is there made up in varieties and forms of this variable species "*Cyrtandra platyphylla*," which is almost the

<sup>2</sup> Rock, Indigenous Trees Haw. Isl. page 21, also plate 145.

despair of the systematist who wishes to bring some order into this group.

*Cyrtandra platyphylla* is evidently the outcome of *Cyrtandra cordifolia*, *C. tintinnabula*, *C. malacophylla*, etc. The latter occurs on West Maui (the older portion of Maui) and *C. tintinnabula* on Hawaii proper in an older section of the island, while *C. cordifolia* occurs on Oahu and a variety of the same, var. *gynoglabra*, on East Maui, that part of Maui nearest to Hawaii. The glabrous ovary of var. *gynoglabra* brings it close to *C. platyphylla*, while otherwise it has all the characters of *C. cordifolia* from which it cannot be separated. We find several links here between these species; for example, variety *stylopubens* of *C. platyphylla* has a glabrous ovary and a hirtulous style, while *gynoglabra* of *C. cordifolia* has a glabrous ovary and style which brings it closer to *C. platyphylla*, while the former would appear to be also a link between the two species mentioned, namely, *C. platyphylla* and *C. cordifolia*. *C. malacophylla* seems to be nothing more than an intermediate occurring on Maui, an intermediate island, while *C. Pickeringii* seems to be some sort of an offspring of *C. cordifolia*, and *C. Garnottiana*. The species with the most villous ovary is *Cyrtandra kealiae* which occurs on Kauai, the oldest island of the group. *C. cordifolia* comes next on Oahu, and finally we reach *C. platyphylla* with a perfectly glabrous ovary and style.

*Cyrtandra platyphylla*, as in the case of other plants belonging to rather large families or representatives of such, occurring on Hawaii, are prone to variation. There are a great many varieties and forms which must be classified in some way. Asa Gray states, "*Leaves subrotund-cordate at the base*," while Hillebrand states, "*suborbicular, ovate-oblong, rounded or sometimes subcordate but oftener contracting at the base*." Hillebrand in his key bases the distinction between *C. platyphylla* and his *C. paritiifolia* (*C. malacophylla*) on the cordate leaves in the latter, and rounded or decurrent leaves in the former. The typical form collected by Pickering in the forests of Hawaii (and not Oahu), which the writer examined in the Gray Herbarium, has decidedly cordate and not decurrent leaves. The writer has at his disposal a large amount of material apparently referable to *C. platyphylla* according to Hillebrand's description of the species. It seems advisable, however, to separate the decurrent leaved forms from the typical one with cordate leaves, which is not uncommon around the Volcano of Kilauea where Pickering in all probability collected the material which served as the type for *C. platyphylla*.

The species is very common all over Hawaii, if we regard it as a variable species. The typical *C. platyphylla* was collected by the writer in the forest near Kilauea Volcano on Hawaii. As the description by Asa Gray is rather brief especially in regard to inflorescence, the following may serve as the diagnosis for

**CYRTANDRA PLATYPHYLLA typica** Rock (See Pl. XXI)

Leaves large, suborbicular, rounded or cordate at the base, shortly acuminate at the apex, 12–20 cm. long and wide, the petioles 3–6 cm. long, pubescent to hirsute on both sides with yellowish-brown multicellular, transparent hairs, especially so on midrib and veins as well as petioles, the latter densely hirsute, the hairs darkening to deep brown near the equally brown hirsute stem; inflorescence hirsute, the peduncle 4 cm. long, bearing at the apex two obovate acute sessile bracts, the latter 20 mm. long, 8 mm. wide, and several-nerved; two distinct cymes at the end of this common peduncle, each bearing three to four long-pedicellate flowers, making the inflorescence subumbellate; between these two cymes two single, long-pedicellate flowers, the lateral cymes possessing a secondary peduncle 1 cm. long, and pedicels varying in length from 12–20 mm.; the central pedicels without secondary peduncle being 25 mm. long; calyx unequally divided into five lobes, hirsute on both sides; corolla tube about 15 mm. long, cylindrical, straight, hirsute outside, with the exception of the lower portion, exserted, the lobes rounded, spreading and subequal, glabrous inside as is the tube; ovary oblong; style, including the very small, bilobed stigma, 5 mm. long; ovary and style absolutely glabrous.

HAWAII: In forests, U. S. Explor. Exped., in Gray Herbarium; forests near Kilauea Volcano, flowering Aug., 1917, Rock no. 12990 in herb. College of Hawaii.

The plants coming nearest the typical form described above are:

**CYRTANDRA PLATYPHYLLA stylopubens** Rock n. var.

Leaves suborbicular, coarsely serrate, 12 cm. long, 10–12 cm. wide, rounded (not cordate) at the base, shortly acuminate at the apex, sparingly hirtulose on the upper surface, the transparent cellular hairs caducous on the older leaves, only very sparingly hirtulose underneath, thin-papery; petioles 3.5–5 cm. long, hirsute; inflorescence a few (three-) flowered cyme; common peduncle 10–12 mm. long, bearing at the apex a pair of subfoliaceous, ovate-acute bracts, 1 cm. wide and 2 cm. long; pedicels about 15 mm. long when with flower, 20 mm. when with fruit, hirsute throughout with dense pubescence, the hairs 1.5 mm. long, horizontally spreading, the pedicels dilating near the calyx; calyx thin, submembranaceous, green, but with numerous scattered brownish hairs; the lobes lanceolate-oblong, irregular in length and

width, each lobe with a strong median nerve and often two lateral ones, 10 mm. long, 5 mm. wide, acute; corolla scarcely exerted, curved, pubescent outside only to half its length, but distinctly and prominently nerved, entirely glabrous inside; ovary ovate, glabrous; style distinctly articulated near the ovary, pale brown and swollen at the base (obclavate), and hirtulose in the upper three fourths.

HAWAII: Forest of Paauhau no. 3, northern slopes of Mauna Kea, elev. 4,000 feet, flowering July 5, 1909, Rock no. 4064, and July 6, 1909, Rock no. 4493, type in herb. College of Hawaii.

The variety *stylopubens* differs from the species in many ways, but especially in the obclavate pubescent style, almost hidden corolla, in the short peduncle, and large calyx lobes. The leaves are not cordate but rounded at the base. The ovary, instead of being oblong and continuous with the style, is ovate and constricted at the base of the articulate style. The plant is almost worthy of specific rank.

CYRTANDRA PLATYPHYLLA *STYLOPUBENS* forma *ovata* Rock n.f.

Leaves ovate-oblong, acuminate, subglabrous above, with a scattered pubescence underneath, especially along midrib and veins, the margin serrate, often coarsely serrate to near the contracted base; inflorescence as in the preceding; calyx thin, membranaceous, green, pubescent outside, glabrous inside, the lobes strongly one-nerved; corolla slightly protruding, the lobes larger and rounded; fruit oblong, the calyx persistent and enclosing the fruit, but the lobes deeply cut to near the base when with fruit.

HAWAII: Paauhau Forest no. 3, flowering and fruiting July 6, 1909, Rock no. 4495 in herb. College of Hawaii.

This form of variety *stylopubens* differs from the latter in the oblong leaves, and in the larger calycine lobes which are glabrous inside; the leaves are coarsely serrate to near the base.

CYRTANDRA PLATYPHYLLA *parviflora* Rock n. var. (See Pl. XXII)

A shrub 3-4 m. high; leaves large, 25-28 cm. long, 10-14 cm. wide, thin, chartaceous, bluntly serrate to denticulate, ovate-oblong, acuminate at the apex, acute and contracting at the base, dark green above, very sparingly hirtulose, pale yellowish-brown beneath, finely and densely velvety-pubescent, the pubescence short; petioles 7-10 cm. long; inflorescence a three- to five-flowered cyme, hirsute with brownish-yellow multicellular hairs; peduncle about 2.5 cm. long, bibracteate at the apex, the bracts linear-oblong, distinctly three-nerved, 2-2.5 cm. long, 4-5 mm. wide, the pedicels 12-25 mm. long; calyx, including the lobes, 1 cm. long, the lobes lanceolate, acuminate, of unequal length, hirsute outside, glabrous inside; corolla small, the tube cylindrical,

curved, 8–10 mm. long, 2–3 mm. wide, the lobes small, rounded, hirsute outside, glabrous inside; ovary glabrous, as is the style; stigma pubescent beneath the lobes; fruit ovoid to obovoid, scarcely protruding from the calyx.

HAWAII: Forests of the Kohala Mountains, Kohala proper, flowering July, 1910, Rock no. 10339, type in herb. College of Hawaii.

The plant differs from the species and the var. *stylopubens* in the large leaves and mainly in the very small flowers which are nearly hidden in the calyx. The calyx as well as lobes are glabrous inside. The bracts, instead of being ovate or broadly obovate, are linear to lanceolate-oblong.

**CYRTANDRA PLATYPHYLLA membranacea** Rock n. var.

Leaves ovate to ovate-oblong, acuminate at the apex, rounded to contracted at the base, the petioles 4–7 cm. long, thin membranaceous to subchartaceous, 12–14 cm. long, 6–8 cm. wide, hirtulose on both sides, dark above, pale beneath; inflorescence cymose, consisting of a peduncle 2–3.5 cm. long, and pedicels varying from 1–2 cm. long, the latter especially pubescent with yellowish hairs towards the base of the calyx; calyx thin-membranaceous, green, hirsute with scattered hairs; corolla pubescent outside; ovary and style glabrous.

HAWAII: Woods above Waimea in swampy forest, elev. 3,000–3,500 feet, flowering and fruiting July 6–10, 1909, Rock no. 4497 and 4078 respectively, the latter specimen from Holokaiea gulch back of Waimea. Type 4078 in herb. College of Hawaii Herbarium; Waimea, flowering Aug. 26, 1916, A. S. Hitchcock no. 14368 in U. S. Nat. Herb.

Differs from the species in the membranaceous leaves which are contracted at the base. Only a single fruit seems to develop from an inflorescence; the bracts are caducous and the junction between the peduncle and pedicel is often not discernible, which gives it the appearance of having single-flowered continuous pedicels (no. 4497). Here also belongs no. 13066, collected on the southern slopes of Mauna Loa, in the forests of Malehu, Kau; the plant agreeing exactly with those from Waimea of the same island save in the pedicels which are shorter.

**CYRTANDRA PLATYPHYLLA hiloensis** Rock

*Cyrtandra platyphylla* A. Gray  $\beta$  var. Hillebr. Fl. Haw. Isl. 329. 1888.

"Peduncle and pedicels only 8–12 mm. long; calyx and corolla much shorter, the former less deeply lobed, the latter curved and exserted; fruit short-ovoid, enclosed in the calycine tube; leaves thick, with strong and straight nerves."



HAWAII: Woods of Hilo, leg. Lydgate, in herb. Berlin, part of type in herb. College of Hawaii, no. 13065. This variety was not collected by the writer.

CYRTANDRA PLATYPHYLLA **robusta** Rock n. var.

Plant stout, robust, the stems strongly quadrangular and of almost even thickness to the apex, densely villous-hirsute, with dark reddish-brown hairs; leaves ovate-oblong, acute or acuminate, with denticulate margins, covered with multicellular hairs on the upper surface, densely villous-tomentose beneath, as are the petioles; peduncle about 3 cm. long; pedicels 1.5–2.5 cm. long, three-flowered, densely villous as are the obovate, acute bracts and calyx, the latter subequally divided to beyond the middle into oblong acuminate lobes, which are hirsute on both sides; corolla slightly protruding, the small rounded lobes glabrous on both sides, with the exception of the margin which is slightly ciliate, the tube hirsute nearly to the base, but more so in the upper part; ovary glabrous; style hirtulose with scattered multicellular hairs.

HAWAII: Kawaiinui ditch trail, Kohala, dense rain-forest, elev. 3,500 feet, flowering June, 1910, Rock no. 8317, type in herb. College of Hawaii.

This variety, which has the hirtulose style in common with var. *stylopubens* of the same species, differs from that variety in the very stout quadrangular stems, dense villosity, longer peduncles, more robust inflorescence, and in the thick calyx lobes which are densely hirsute on both sides.

CYRTANDRA BACCIFERA C. B. Clarke in DC. Monogr. Phan. 5: 228.  
1883

The writer is not acquainted with this plant, nor has he seen the type. When the type will have been examined it will undoubtedly prove to be only a variety of *Cyrtandra platyphylla*. Clarke's description may answer any of the forms of that species, as for example "*folia opposita, pedunculi saepe oppositi*," etc.; there is nothing definite in the description whereby it could readily be distinguished from *Cyrtandra platyphylla*. In conclusion he states: "*species C. Pickeringii forsan affinior, ab hac differt (inter alia) ovario baccâque glabris*"; this however is one of the main differences between *C. Pickeringii* and *C. platyphylla*. It is true that the former has broadly triangular calyx-lobes, but those of the latter species are exceedingly variable, and calycine lobes as described by C. B. Clarke in *C. baccifera*, "*late lanceolati*," occur certainly in *C. platyphylla*.

**Cyrtandra caulescens** Rock n. sp. (See Pl. XXIII)

Stem somewhat prostrate, terete in the lower portion, subquad-rangular in the upper, hirsute with dark brownish hairs; leaves membranaceous to chartaceous, ovate, acute at both ends, light green above, paler underneath, the margins irregularly serrate to dentate, hirsute on both sides, about 15 cm. long, 8 cm. wide, the petioles 4.5 cm. long; inflorescence a much-branching hirsute cyme, not proceeding from the leaf-axils, but from the prostrate stems near the roots, or somewhat above the ground, in dense shade and almost hidden; the two common peduncles opposite each other, around old leaf scars, about 12 mm. long; flowers numerous, on short pedicels; bracts small, lanceolate, 6 mm. long, 1 mm. wide; calyx tube 5 mm. long, campanulate, hirsute with brownish hairs, the truncate broad lobes 3-5 mm. long, 2.5-3 mm. wide, hirsute inside and outside; corolla 8 mm. long, urceolate, constricted at the middle, hirsute in the upper two-thirds only, the lobes small, rounded, hirsute; ovary glabrous.

MAUI: East Maui, dense forest of Hamakua, elev. 4,000 feet, on the banks of a stream near Honomanu gorge, flowering Sept., 1910, Rock (type) no. 8556 in herb. College of Hawaii.

This species is very remarkable for its densely glomerate inflorescence which is borne along the woody portion of the plant near the ground and often on protruding roots. In that respect it comes close to another new species found in deep ravines on Oahu along streams, belonging to a different section. The Oahu species has the flowers on long branching racemes, but they are also borne on protruding roots and along the lower portion of the stem.

CYRTANDRA PICKERINGII A. Gray, Proc. Amer. Acad. 5: 350. 1862

A shrub, the branches densely ferruginous to reddish villous or subhirsute; leaves ovate, oblong-lanceolate, acuminate at both ends or the base cuneate or almost round, serrate, up to 16 cm. long, 5-9 cm. wide, villous on both sides but sparingly so on the upper surface, pale yellowish-brown on the lower, the petioles 2-6 cm. long; peduncles 1-2 cm. long, three- to seven-flowered; bracts 12 mm. long, free, ovate-lanceolate; cyme somewhat loose, simple to dichotomous, pedicels 1-3 cm. long; calyx 7 mm. long, divided to the middle into four to five lobes, the lobes oblong to subovate, persistent; corolla 12-15 mm. long, straight, villous outside; ovary glabrous or slightly pubescent, the style glabrous, clavate; fruit 12 mm. long, ellipsoidal, densely but shortly villous.

OAHU: Mountains of Oahu, Hillebrand no. 322 in herb. Kew, in herb. Berlin and in herb. College of Hawaii; Koolau Mts., Punaluu ridges, flowering Dec. 3-14, 1908, Rock no. 763, same locality Dec.

24-29, 1908, flowering, Rock no. 388, in herb. College of Hawaii; Kalihi Valley, flowering, Aug. 2, 1916, A. S. Hitchcock no. 14105, in U. S. Nat. Herb.

KAUAI: Around Pohakupili, Wawra no. 2191 (*foliis lanceolate-ellipticis*), in herb. Vienna (teste C. B. Clarke).

The form mentioned by C. B. Clarke under *C. Pickeringii* is referred to that species on C. B. Clarke's authority. The writer has not seen this plant nor has he collected any plants on Kauai which could be referred to *C. Pickeringii*.

In the writer's material of *Cyrtandra Pickeringii* the ovary as well as style is glabrous. In Hillebrand's plant the ovary and style are slightly pubescent; the leaves of his plants are large, measuring 16 cm. in length, and are rounded at the base. The leaves in the writer's plants from the Punaluu mountains are acute or acuminate at both ends as called for in the original description; the inflorescence is a lax cyme with peduncles 3.5 cm. long and pedicels of variable length up to 2.5 cm.

Hillebrand classes *C. honolulensis* Wawra with *Cyrtandra Pickeringii* A. Gray. It is true that the former is very close to the latter; Wawra himself says that he is at a loss exactly where to place this plant as it forms an intermediate between *C. Pickeringii* and *C. Lessoniana*. C. B. Clarke upholds Wawra's species and places it even in another section. The plant is not specifically distinct but may well be considered a variety of *C. Pickeringii* A. Gray. (See *C. Pickeringii honolulensis* (Wawra) Rock.)

CYRTANDRA PICKERINGII **waiheae** Rock n. var.

*Cyrtandra Pickeringii* forma *ovato-elliptica* Wawra, Flora 3: 564. 1872

Leaves ovate-elliptical, chartaceous, acuminate at the apex, rounded at the base, slightly asymmetrical, coarsely and irregularly serrate, pilose on both sides, 10 cm. long, 6 cm. wide, the petioles 1 cm. long; cyme with one or three pedicels; peduncle 3 cm. long, hirsute; pedicels of the same length, bracts small, ovate, 10-12 mm. long; calyx campanulate, thin, membranaceous, the lobes short, acute; fruit ovate, glabrous.

MAUI: "Um Waihee," Wawra no. 1819 in herb. Vienna, part of type in the herb. College of Hawaii.

This variety is here referred to *C. Pickeringii* with some hesitation. The material is rather fragmentary, and in absence of flowers cannot be determined more definitely. It is distinct from *C. Pickeringii*,

and differs from it in the thinner leaves, which are coarsely serrate and in the membranaceous calyx. The ovary is glabrous as in the species.

CYRTANDRA PICKERINGII **honolulensis** (Wawra) Rock

*Cyrtandra honolulensis* Wawra, Flora 30: 567. 1872.

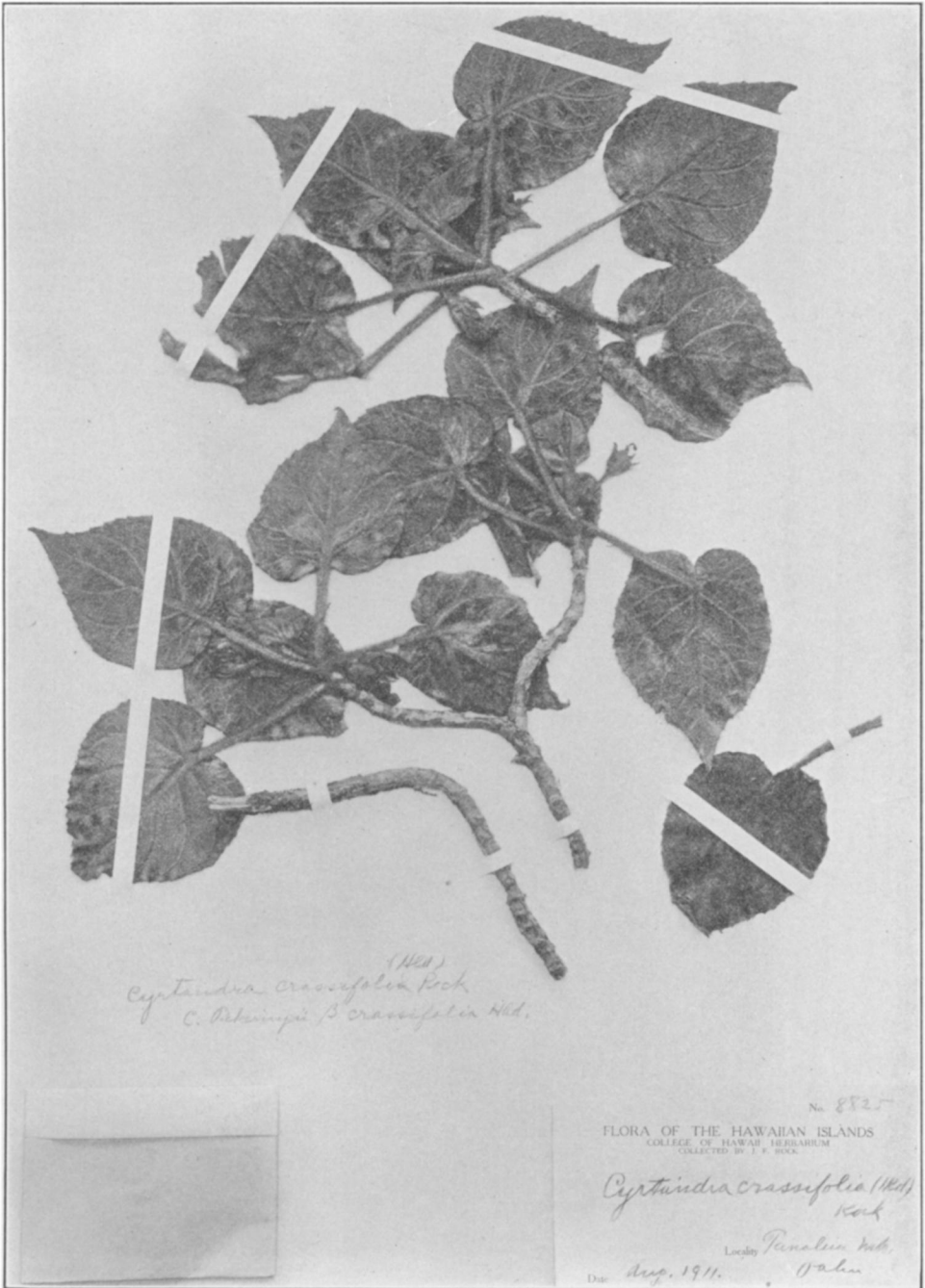
*Cyrtandra Pickeringii* A. Gray; Hillebr. in part, Fl. Haw. Isl. 327. 1888.

A much branching shrub; leaves subcoriaceous, ovate, shortly acuminate at the apex, rounded at the base, serrulate, sparsely covered with whitish hairlets at the upper surface, whitish-yellow-silky beneath, 10 cm. long, 5-6 cm. broad, the petioles 4 cm. long; peduncle slender, one to several-flowered, pedicels 0-15 mm. long; bracts 0-1 cm. long, obovate-oblong, obtuse; calyx crateriform, 5-fid, the lobes triangular, acute; corolla 2 cm. long, straight, broadly cylindrical; ovary and style hirsute.

OAHU: Near Honolulu, Wawra no. 1720 in herb. Vienna, part of type in herb. College of Hawaii; Hillebrand no. 328 in part, herb. Kew; Koolau Mts., Punaluu, flowering, Aug., 1908, Rock no. 10 in herb. College of Hawaii.

This variety differs from *C. Pickeringii* A. Gray mainly in the hirsute ovary and style; the cymes are not lax, but usually single to three-flowered. The leaves are thinner, almost membranaceous (when dry). It is not uncommon in the mountains behind Honolulu.

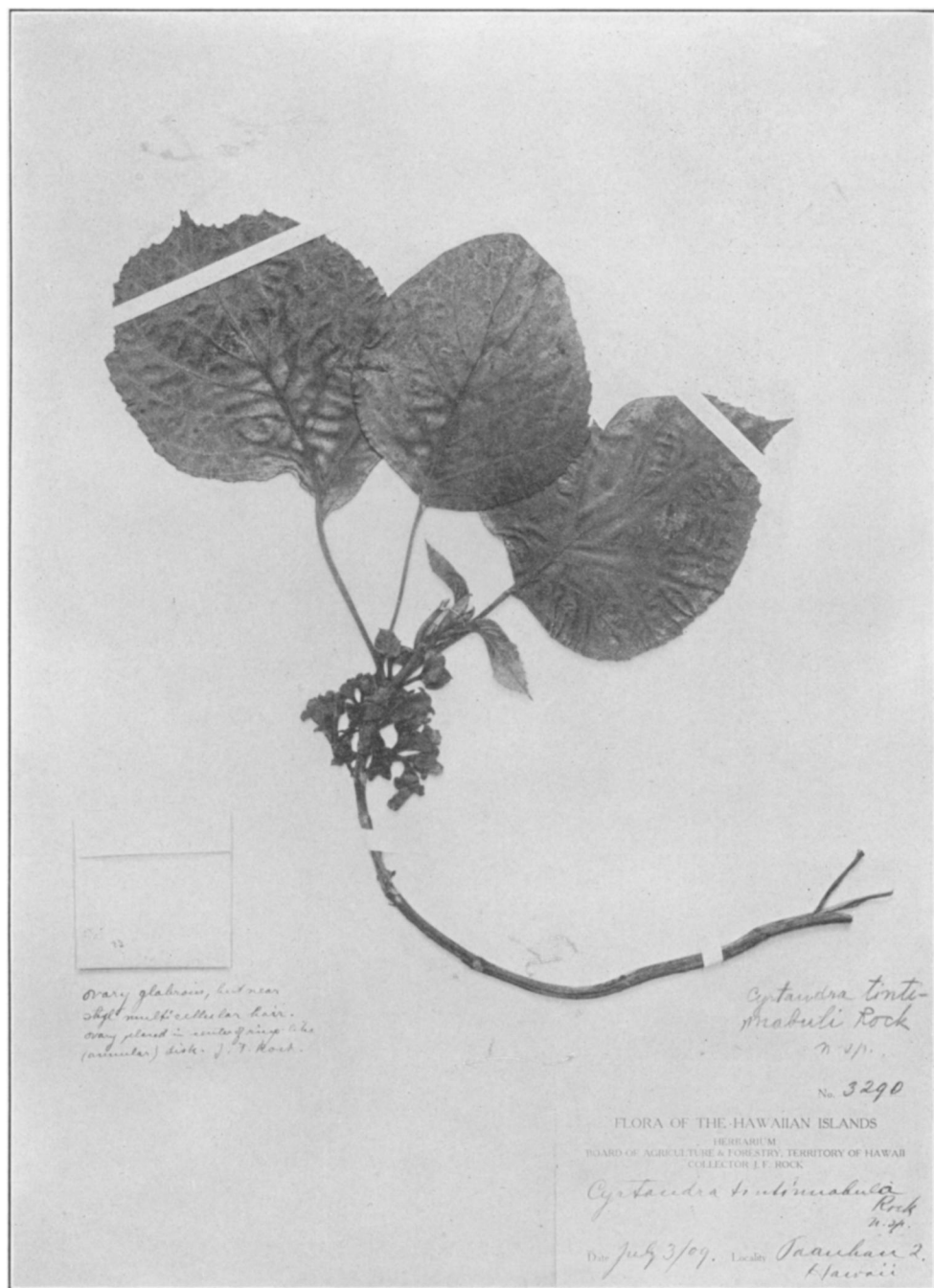
COLLEGE OF HAWAII, HONOLULU



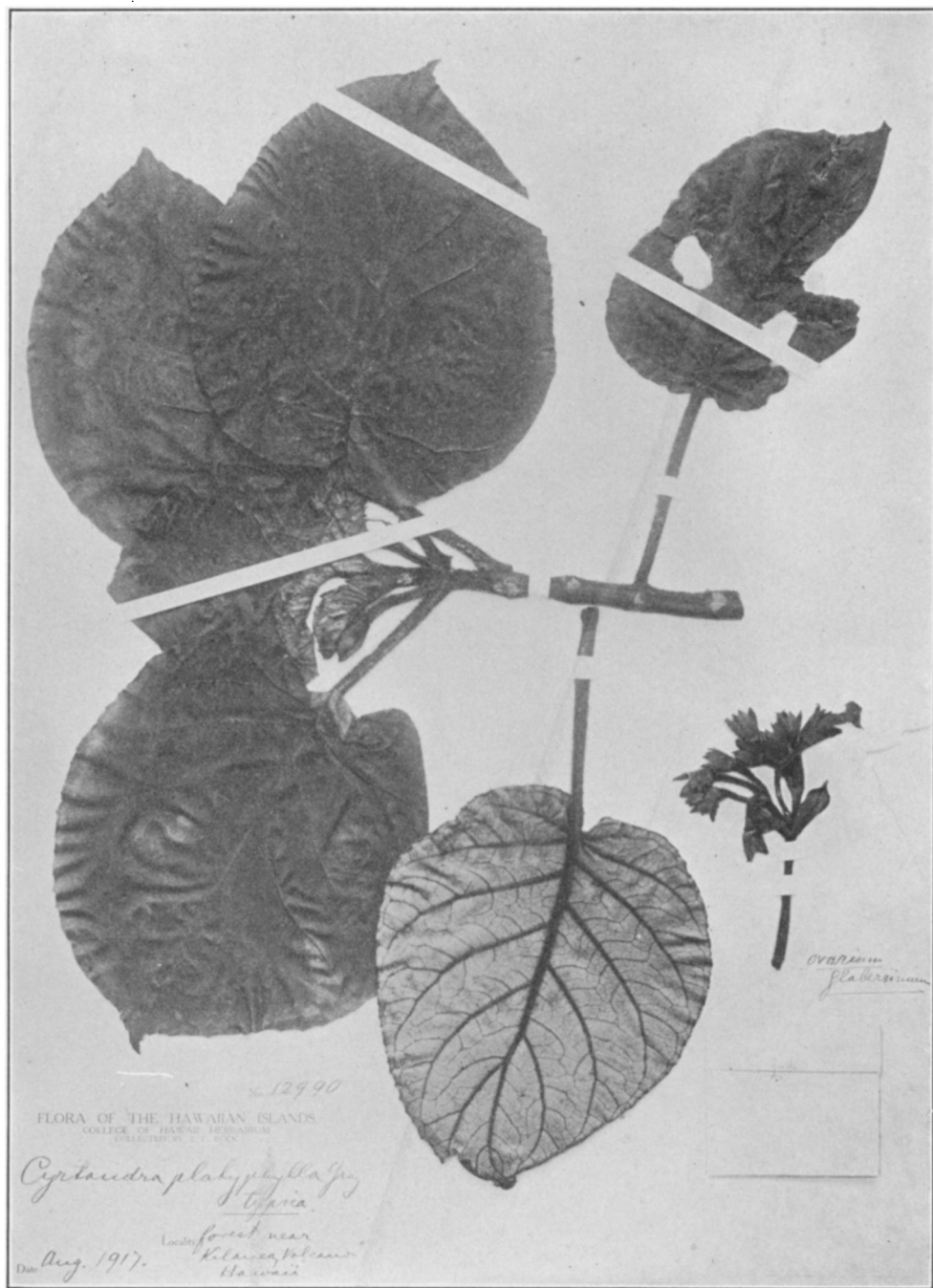
ROCK: CYRTANDRA CRASSIFOLIA (HILLEBR.) ROCK



ROCK: CYRTANDRA MAUIENSIS ROCK

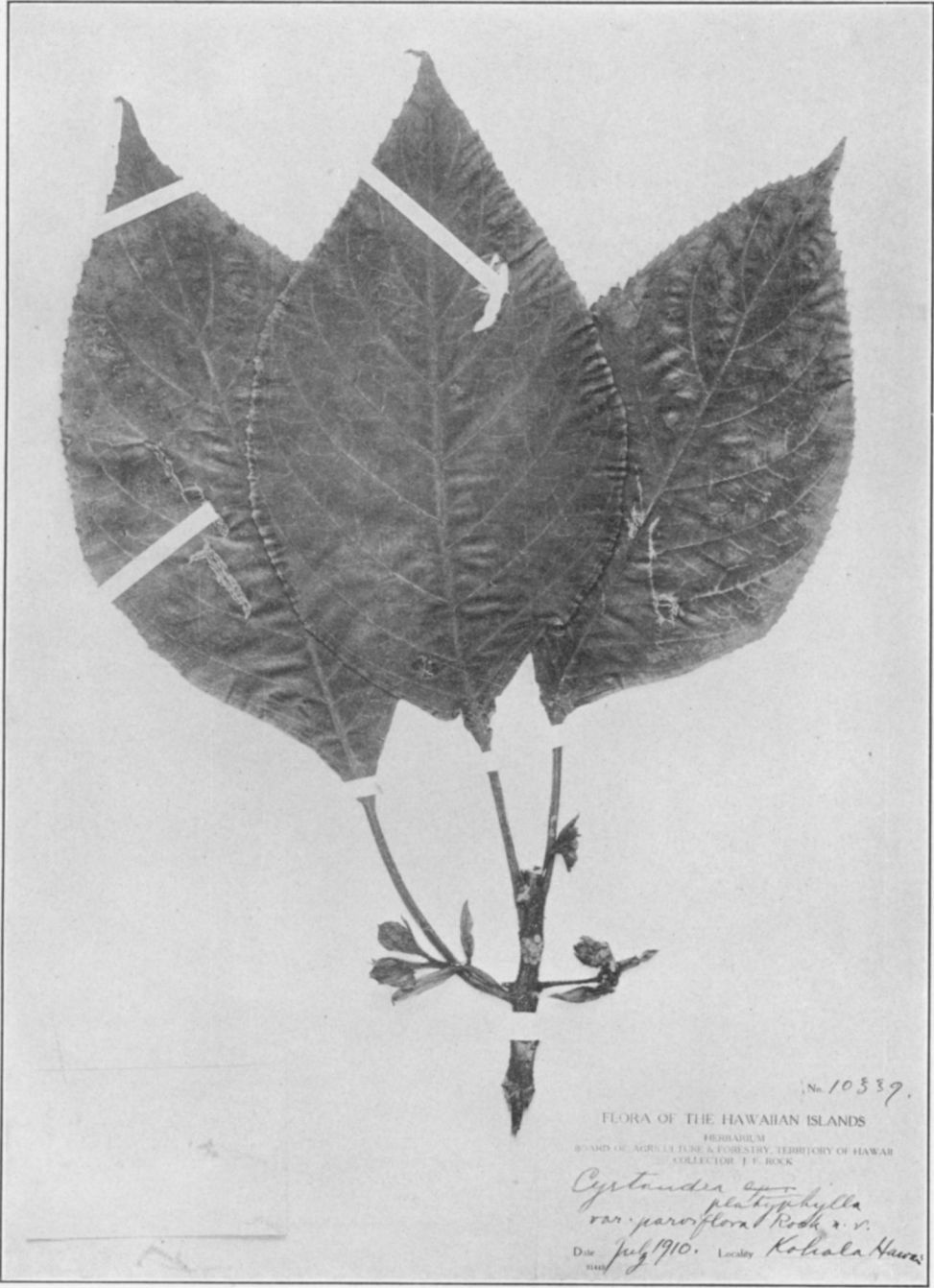


ROCK: CYRTANDRA TINTINNABULA ROCK

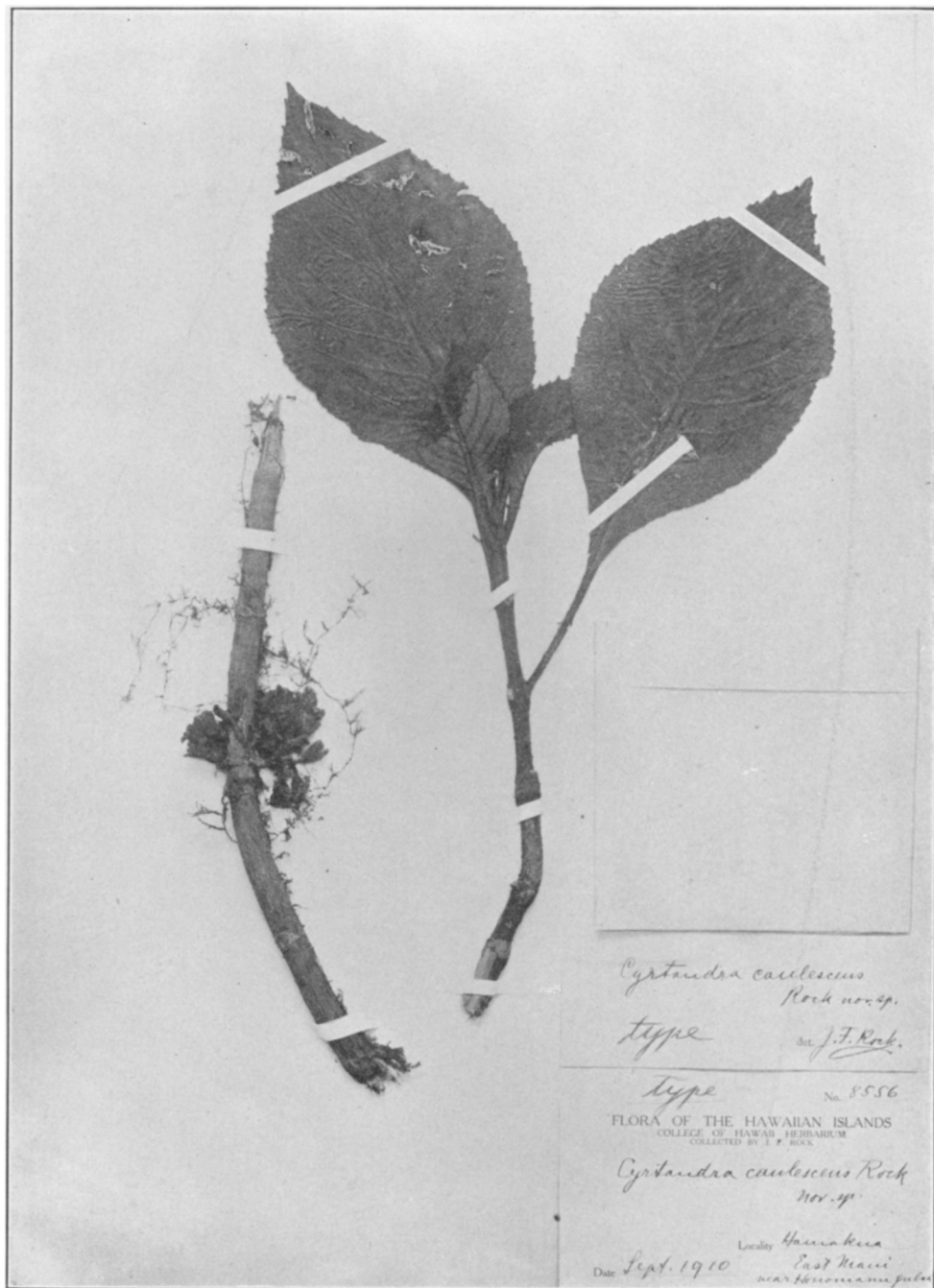


ROCK: CYRTANDRA PLATYPHYLLA TYPICA ROCK





ROCK: CYRTANDRA PLATYPHYLLA PARVIFLORA ROCK



ROCK: CYRTANDRA CAULESCENS ROCK